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THE GEN'L W. S. HANCOCK, EQUESTRIAN STATUE.

PHOTOGRAPHED BY
T. A. MULLETT, WASHINGTON, D. C.

H. J. ELLICOTT, SCULPTOR.

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THOS. H. McCOLLIN, Managing Editor.

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VOL. XVII. MAY, 1896. No. 197.

THE DEVELOPMENT OF OVER-EXPOSED PLATES.*

BY HERR H. SCHMIDT, OF MUNICH.

AMONG the numerous formulas published for the various photographic manipulations, one of the most important has thus far received but little attention,—viz., the development, or, we may say, the improvement of an over-exposed plate.

Over as well as under-timing is a frequent occurrence, not only with beginners and amateurs, but happens to both the professional and advanced amateur. When cases arise where exposures are made under conditions foreign to the usual practice, it frequently happens that it is almost impossible to properly judge the correct time for exposure. The result is an either over- or under-timed plate. In every case, however, it is best to err upon the side of too much rather than too little time, as the former fault can easily be manipulated in the course of development so as to insure a useful negative. With an under-timed plate, on the contrary, the possibility of saving the plate by any special manipulation during development is a very circumscribed one.

It is not the purpose of this paper to deal with under-exposures

* Read before the "Freien photographischen Vereinigung zu Berlin." Translation for AMERICAN JOURNAL OF PHOTOGRAPHY by J. F. Sachse.

or their betterment, but to confine it to methods as offer us means for the improvement of such as are over-exposed.

The problem under discussion is to be divided into two parts. (1) Where the operator is cognizant of the overtiming; (2) cases where an uncertainty exists as to the time of exposure.

In the first instance the operator will either mix his developer accordingly, by an addition of several drops of potassic bromide to his normal solution, or he may resort to either the system of a slow vertical development, or he may over-develop his plate, and then try to save it by a careful reduction. Some operators, where over-timing is known, subject the plate to a preliminary bath of a concentrated aqueous solution of cupreous bromide, with beneficent results.

In cases where the operator is not clear as to the proper timing, it is advisable to start the development with an old developer, and continue with a gradual substitution of fresh solutions according to circumstances.

In most cases, however, this procedure fails to answer, and where the excess in timing is very marked, one is forced to leave the negative to take its own course.

I have endeavored therefore to find some method by which we may correct any amount of over-exposure, and thereby control the character of the resultant image.

A procedure of this kind must be of a nature to permit a view of its gradual action, and that it may be judged by the trained eye of the operator during every stage of its development.

When one has an exposed plate, where it is not known whether the time was normal or excessive, the plate is to be placed in a tray, and the developer poured over it as usual; if the image flashes up quickly and flat, and gradually disappears in a gray fog, the plate was over-exposed. A plate of this kind should at once be taken out of the developer, and well washed under the tap. The condition of the plate at this stage is as follows: The haloid salts contained in the sensitive film during their exposure to the light have undergone two changes, consisting not merely in a chemical dispersion (Zerstreung) upon which the above-mentioned chemical development is based, but they have also

developed the peculiar property of a physical development, in so far that the exposed parts show an affinity for the metallic silver in a reducing solution of argentic nitrate, whereby the film darkens in proportion to the relative action of the light, or in other words the high lights are strengthened while the dark shadows are not affected.

The chemical changes of the haloid salts bear no relation to the physical ones. Thus it appears that of argentic chloride, bromide and iodide, the former is chemically the most sensitive, while the physical action of the argentic iodide surpasses all the others.

In other words, the greatest changes of argentic chloride have not been reached when the chemical reduction is complete. Consequently when the chemical development has resulted in an over-timed flat negative, and is then subjected to a proper physical development, we obtain a secondary image showing all the characteristics of an under-exposure.

Now as both of these images are upon the plate in exact register, we produce by such combination a normal result, saving the over-exposed plate and giving us a perfect positive print.

In the practical manipulation of this process, the plate, after having been taken out of the developer and well washed, is then placed in a negative silver bath,

Nitrate of silver - - - -	5 g.
Water, distilled - - -	100 cc.m.

where it is to remain for several minutes until the gelatine film has absorbed sufficient silver nitrate.

The plate is then to be re-developed by flowing the developer over the plate, similar to coating a wet plate.

The object of this is to prevent any of the silver nitrate being lost from the plate. For such as are not familiar with the wet collodion process, we will state that the plate is held in a horizontal position, and the developer is poured on at one corner, and thence spread evenly over the plate.

The image comes up gradually; as soon as sufficient strength appears the action is stopped by washing under the tap, after which the plate is fixed as usual.

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In case this system of physical development fails to give a sufficient contrast, which is frequently the case where the over-timing has been excessive, the plate may be further intensified, same as an ordinary collodion wet plate. For this purpose any of the mercurial, lead, or cupreous intensification formulas may be used. Still better, however, is the following pyro-silver intensifier, to be used prior to fixing.

The carefully-washed plate is flowed with a sufficient quantity of the following solution:

(1)	Pyro	10 g.
	Alcohol, 96 per cent.	100 cc.m.
(2)	Argentic nitrate	4 g.
	Citric acid	6 g.
	Distilled water	200 cc.m.

For use take

No. 1	4 cc.m.
Distilled water	100 cc.m.

and immediately before use add an equal volume of No. 2.

A 5 by 7 plate requires about 25 cc.m. of above solution. No more than is necessary should be mixed at a time, as the diluted solution will not keep.

When the intensification has progressed sufficiently the plate is to be well washed and fixed in the usual manner, bearing in mind to wash well before the final drying.

The speaker further stated that the procedure had been applied to cases where from six to ten times the proper time had been given, and in every instance with satisfactory results.

It is, however, advisable that operators who wish to make any extended use of above process, familiarize themselves with the collodion wet plate process, if not already acquainted with it, as the whole principle of above manipulation is based upon the old collodion process.

Senefelder's discovery of lithography in 1796 is to be celebrated by a great exhibition of lithographs in Paris next year.

WHAT IS GAINED BY THE COMPETING ARTIST AT A CONVENTION WHO DOES NOT WIN A MEDAL?

C. W. HAYES.*

THE benefit to be derived from making an exhibit of one's work in any field of science or art, whether the exhibitor obtains meritorious mention or not, is so great that it would seem as if a discussion of the basic principles were unnecessary; but there are some who have not been willing to admit this gain—some who say that they are not repaid for the time and labor put upon an exhibit, where nothing is derived in the way of flattering prizes or notice to the public.

Let us take the question for a moment away from any particular line of art, and see how far such a statement is wrong. In the first place human knowledge is but experience, and the very first principle of experience is in comparison. The finite can know nothing of the infinite, because he cannot comprehend a state that is limitless—his own experience being limited. If one photographer, to return to our own best known branch, could never see the work of another, he would be unable to discern wherein his work was susceptible of improvement, or wherein he had made a failure of a certain thing that, easy in itself when seen worked out by someone else, is worth thousands of dollars in the course of a business life.

In its simplest form, competition is but comparison systematized, and whether one, by that systematic comparison, is decided best or not—whether, in other words, he wins a prize or not,—he has had the benefit of seeing those comparisons; and unless he is so egotistical that he will not see good in others' work, he is sure to be a gainer. The manner of appointing the judges is such that there can be no question of unfairness. This article is, however, not intended for the prize winners, but for those who have exhibited in the past, and will at the coming sixteenth convention of the Photographers' Association of America.

* President P. A. of M., Treasurer of P. A. of A.

From the very inception of that exhibit there is a chance for improvement; the comprehensive workman endeavors to excel his best previous work, and in the study and labor he evolves something of merit that he never had before. He is striving after something, and that very striving means advance. It is unfortunate, if you will, but true, that one cannot stand still; it is always either progress or retrogression. Unless one aims for something ahead, one lives in the past, and in that living becomes a part of the past.

With the exhibit ready, there is another gain; one mind cannot know it all, and in the multiplicity of minds there is much learning, and in comparison much experience. Go to the convention with your exhibit, and watch the manner of the people who view it. You need no judges to tell you what group attracts, and your artistic eye, unless willfully blinded, will in a measure tell you why. That is the effect, that the treatment, that the lighting, and that the posing, that they like; and those are the points, if improved, by which you will add to your exhibit next year. You may not get a prize, but you have what is better —the reason why you failed to win. Knowing these reasons, you are then in position to win not only what you covet at these annual displays, but those more substantial marks of public esteem—dollars and cents.

Do not flatter yourself that the public is ignorant of good pictures and their points, for if you do you will make a serious mistake. The public does know the value of artistic work, and those who would cater to the public must recognize it. The days of the old perambulating picture gallery, drawn around by a sorry-looking horse, are everlastingly gone, never to return, and the reason is the improvement. Even the most dense mind now refuses to be satisfied with the hack work of the old time. Would you know why it is? Would you seek the real reason? It is easy to find. For sixteen years the photographers have been educating themselves in their art through conventions, and unintentionally they have accomplished a much greater work, and have at the same time educated the public to a standard of work and art that it would not have known but for this condition.

It was not the prize-winners who did this—not at all; but rather those men who year after year labored on, exhibited every year, and took back home with them ideas which the public mind, comparing the artist's work with that of the novice, readily recognized as valuable, and forced the other man, the one who would not thus learn—the old fogy—out of the business. By the same comparison which you learned, the public was taught, and they had not those delicate and true opportunities of the man who sees his work side by side, it may be, with that which wins the first prize.

I was much struck on the potency of exhibiting without winning by the course of a young photographer of my experience. He has been in the work but a few years, and I remember how I laughed at his first exhibition. It was laughable. The young man was there—has been in every convention; and only a few days ago when I saw the improvement of the past year (for I had noticed improvement almost monthly), I was impressed by it, and asked him if he intended to make an exhibit this year. He said he certainly did—he intended to continue at the same school at which he had learned so much, namely, the conventions and competitive exhibits, and added, with considerable earnestness, that he should consider himself not only foolish from a business standpoint, but an ingrate also, not to aid in the exhibition of the Association which had done so much for him. That man will one day be a medal winner, and simply add another living example to the good that comes from non-winning competition.

A Safety Envelope.—A patent for a safety envelope has recently been taken out by a Newark inventor. The envelope does not differ materially in appearance from the ordinary envelope, except that there is at the back but one flap, the top one. The envelope can be opened very quickly and with absolutely no risk of damaging the contents. At the bottom of the envelope there are two folds, instead of one. At the bottom left hand corner is a small aperture, to admit the knife, which does not come in contact with the inside of the letter. The knife cuts but one of the folds, while the other fold, in which lies the contents, remains intact.

THE NEW SHADOW PHOTOGRAPHY.*

BY MR. A. CAMPBELL SWINTON.

THE subject of this lecture, or this demonstration, as I would rather call it, is very difficult to name, for the reason that as soon as you begin to name it you quarrel with somebody. One name that has been given to it, and the name which is probably the most widespread, is "The New Photography"; it is a very good name, only it, unfortunately, labors under two disadvantages—first, the subject is not new, and second, a large number of eminent people will not allow that it is photography. I must admit, personally, that I do not quite understand the point of view of these persons. I take it that photography has to do with light, and I take it that light does not necessarily mean the kind of light that one can see; you talk of ultra violet light, and you cannot see that, and you talk of infra red light, and you cannot see that; and therefore it is difficult, and I do not think it is necessary, to restrict the word *light* to that particular form of vibration of the ether that affects the optic nerve. Captain Abney, who is, of course, a great authority, has suggested that the new process should be called "Electography"; that is not an easy word to pronounce, and I cannot quite understand his point of view. Not very long ago Lord Kelvin stated, when Hertz made his experiments which confirmed the electro-magnetic theory of light of Clerk Maxwell, that those experiments annexed to the domain of electricity the whole science of optics. According to the electro-magnetic theory of light, there is no distinction between electro-magnetic waves and light waves, there is no distinction between Hertzian waves and light waves; and it appears to me very difficult to draw any distinction between waves of the ether.

Now, having got so far, I shall begin at once and try some experiments, for this reason; these experiments that we try, and these photographs that we take, are rather uncertain, sometimes

* Read before the London Camera Club, February 13th, 1896.

they are successful and sometimes they are not, the process has not yet been boiled down to the state that gives absolute certainty, and as these photographs take longer than usual to develop, it is very desirable that we should begin at once, so that if by chance our photographs should prove unsuccessful we should have plenty of time to do others.

[Mr. Swinton then placed on the table six dry plates, cut to lantern size and each enclosed in a double black envelope, purses, spectacles, etc., were laid on the plates, and a Crookes radiant matter tube fixed in position at a height of about nine inches. The tube was illuminated, by means of a Ruhmkorff coil, for twelve periods of fifteen seconds each, with alternate pauses of similar duration to avoid over-heating and consequent fracture of the tube. The plates were then removed and developed, and the negatives obtained were shown on the screen at a later stage of the proceedings.]

The lecturer continued—I have no doubt many members, and a large number of the general public, do not know the difference between what are known as "Crookes tubes" and what are known as "Geissler tubes"; and I therefore propose to show you a number of both Crookes and Geissler tubes, so that you may understand more exactly what happens when we take these photographs. You have all seen ordinary electric sparks [shown]; here is a bulb which at the present time is full of air, and when I connect the terminals inside it with the Ruhmkorff coil, and gradually exhaust the air by means of a pump, you will see the effect of the dimunition of atmospheric pressure. As the pressure is reduced you will see that the nature of the discharge will change; it first of all broadens out, and then it becomes discontinuous, and finally we shall fill the whole globe with a uniform glow. With a pump of this description it takes a long time to obtain very high vacua, such as are required for the experiments that we propose to show you, and consequently I will not try to exhaust this bulb up to the conditions necessary for the experiments, but I will pass on to other bulbs which have been exhausted elsewhere.

The chief distinction between Geissler tubes and Crookes

tubes is this: First of all, in a Geissler tube the exhaustion is considerably lower than in a Crookes tube, and also in a Geissler tube the luminescence which is visible is due to luminescence of the residual gas. This is a Geissler tube with a rather complicated pattern of glass tubing inside it, in which there is a certain amount of air, but only a very small amount, and when I turn on the current you will see this will light up, the difference of the colors being due to the different qualities of glass that have been used in the manufacture of the tube. Here is another Geissler tube with different fluid substances surrounding the inner tube through which the current passes; and you will find that, although these fluids all appear of more or less the same color by ordinary electric light, when we turn on the current they will fluoresce with different colors. These two tubes which I have shown are Geissler tubes—tubes which have only a low amount of exhaustion, but when the exhaustion is continued much farther we get different phenomena—the Crookes phenomena. When I turn the current on to this Crookes tube, the tube itself will not be so brightly illuminated as was the one with the Geissler tube, but owing to certain case radiations that take place from the large terminal, which I will connect with the source of negative electricity, this flat piece of mica coated with sulphide of calcium will become intensely luminescent. We have now passed from the stage in which gas contained in the tube is luminescent, and we have got to the state in which the gas is non-luminescent, and to the luminescence of a solid substance upon which the cathode rays from the negative electrode play. These Crookes tubes are exhausted to very high vacua, I believe, to something less than one-millionth of an atmosphere. A large number of them are made in different forms, but we only propose to show two or three for the sake of illustration.

Here is one containing sulphide of calcium in fine powder at the bottom of the tube, and when the current is applied you will see that a large amount of phosphorescence is set up in the calcium, which continues even after the electrical excitation is stopped. This is a similar tube, but it contains nitrate of strontium, and it gives a yellow color, and only continues to lumines-

cence when the current is turned off. I will show one more tube to illustrate the different effects of these cathodic rays upon various substances this one contains a number of rubies, and the effect is very beautiful.

Now, having seen that certain substances are made to phosphoresce or luminesce with different colors when they are subjected to the radiations, whatever they may be, that proceed from the negative-electrode of these tubes, it is interesting to note certain peculiarities of these radiations. I have here a tube in which the negative electrode is a plate at the back, and the rays proceeding from this plate would naturally be projected against the end of the tube, and would cause the glass of the tube to phospheresce with a green phospherescence, because it is German glass. But in the path of these rays there is an aluminium cross, and when I turn on the current the shadow of the cross will be thrown upon the glass, proving that the rays are propagated in straight lines. I will now remove the cross, and again turn on the light, and you will see, instead of the black shadow cross, a white cross. This is a rather important feature because it means this: after the glass has luminesced for a certain time it gets fatigued and will not luminesce any longer; consequently the portion that was protected from luminescing by the cross will luminesce more brightly than the portion that had become fatigued.

I will now show you another curious feature in connection with the rays from the negative-electrode in a Crookes tube. We have here a tube in which the negative-electrode is at the top, but in the path of the ray there is a piece of metal with a slit in it, so that the ray can only go through in the form of a narrow beam; and when the current is turned on you will see that by bringing a magnet near the tube I shall be able to deflect the beam, that is to say, the cathode rays are deflected by magnetism. This deflection of the cathode rays is one of their peculiarities, and one of the peculiarities that distinguish them from the X rays of Roentgen.

So far we have been dealing entirely with what takes place inside of the exhausted tube, and up to about three years ago

everything that was known with Crookes tubes had reference to what took place inside the exhausted space; but a little more than two years ago Professor Lenard, who had previously been assistant to Prof. Hertz, made a large number of very interesting experiments in connection with bringing the cathode rays outside the tube. He fitted an aluminium window to the tube, having found that glass was exceedingly opaque to these rays. Hertz had discovered that certain thin metallic films, notably aluminium, were more transparent to them, and that an aluminium tube of sufficient strength could be made thinner than a glass tube, and consequently Lenard put an aluminium window to his tube, and found that he was able to get the rays to come outside it. He not only discovered that, but also that these rays, after they had come through the aluminium windows, would produce phosphorescence in various substances outside the tube just in the same way as they had done inside it. He discovered more; he discovered that these rays would affect photographic plates, and that they would do so although opaque substances were interposed in their path; in fact, Lenard really did everything that Roentgen has done on a very small scale, except that he did not happen to try experiments upon portions of the human body or of other animal bodies.

Now, there are various theories as to what these cathode rays are, and also with regard to what X rays are. The question of what the cathode rays really are is an old subject of controversy, and there are two schools of scientists with regard to the matter. Most English scientists, I believe, hold—with Crookes, who investigated them, and, I believe, discovered them, and with Lord Kelvin, whose authority, of course, is very great—that the cathode rays really consist of electrified particles of the residual gas contained in the tube; for, although we are exhausting our tube as high as we can, there is a great deal of gas left. A calculation recently published by Professor Oliver Lodge is very instructive in this relation. I spoke, I think, a little time ago, about Crookes effects taking place when about a millionth of the natural atmospheric pressure was left in the tube; according to Professor Lodge, if we reduce the atmospheric pressure to a one hundred

millionth of an atmosphere there still remains in every cubic inch of the tube something like 1,540 billion complete molecules. So you see there are plenty left. The theory held by most English scientists, and, I believe, supported by Helmholtz among the Germans, is that the cathode rays consist of electrified particles of the residual gas, which being electrified similarly to the negative electrode by contact with it are violently repelled. There is, however, another theory which is held by Lenard and other German scientists of great repute; and that is, that the cathode rays, like light, are some form of ether vibration.

Well, so much for the cathode rays; but when we come to Roentgen photography we have to some extent ceased to have to do with the cathode rays, because we are dealing with what takes place outside the tube. We have also ceased to some extent to deal with what Lenard did, because we do not have an aluminium window. Further than that, it has been proved, both by Professor Roentgen himself, and by very exact experiments made by Professor Oliver Lodge, that the Roentgen rays after they have once got outside the tube are not affected in any appreciable degree by a magnet. Now, as you saw in the experiment a little while ago, the cathode rays are very appreciably affected by even a weak magnet, and therefore it seems reasonable to suppose that the X rays, as Roentgen calls them, are very different from the cathode rays that take place inside the tube. Whether it be that the cathode rays, after having filtered through the glass at the end of the tube become converted into something slightly different; or whether it be that the beating of the cathode rays upon one side of the glass sets up some form of vibration, or what not, on the other side of the glass, by some form of electrical induction or otherwise, it is impossible at the present moment to say. All we know is that the X rays outside the tube are not acted upon by a magnet, but the cathode rays inside the tube are. There are several theories with regard to what the X rays are. Some hold that they are electrified particles of matter again, exactly like the cathode rays inside the tube; the fact that they are not affected by a magnet seems to be in some degree against that theory. There is a theory that

they are very long waves, and that there is a theory that they are very short waves, that they correspond to infra-red light, and that they correspond to ultra-violet light; and there is a further theory, and a very nice one, that they are longitudinal waves and not transverse waves. In order to render this last theory clear, I would like to give an illustration. The waves of the sea, in which the particles of water move at right angles to the direction in which the waves are traveling, are transverse waves; and it is known that the waves of light are transverse waves, similar to the waves of the sea. On the other hand, the waves of sound are longitudinal waves; if you take into account any particular particle of air in a sound wave, that particle of air does not move at right angles to the direction in which the sound is traveling, but it moves backwards and forwards in the same direction. Sound waves are a process of compression and expansion of the air, and longitudinal waves mean that process of compression and expansion; consequently, if we are to imagine that these X rays of Professor Roentgen are longitudinal waves, we have to believe that the ether is compressible and expansible.

There is one very attractive feature with regard to this theory that the X rays are longitudinal waves of the ether. It is found by experiment with photography that the transparency of bodies to these X rays is more or less proportionate with their density. It has been a long time an idea that the action of gravity is due to some form of longitudinal wave in the ether, and it is consequently a very interesting feature of the X rays that they correspond in some respects to the action of gravity; it is an inverse respect, but still it is exceedingly interesting from a purely scientific point of view.

[Mr. Swinton here took a photograph of the Chairman's hand, the operation being similar to that described in the case of the purses, etc., and he then described the construction of the tube by means of a diagram. A series of slides was then exhibited illustrating the nature of the positive and negative discharges and the discharge from a Tesla coil, and also a diagram showing the arrangement of the Tesla coil used by Mr. Swinton.]

Apart from the form of the tube, the chief practical require-

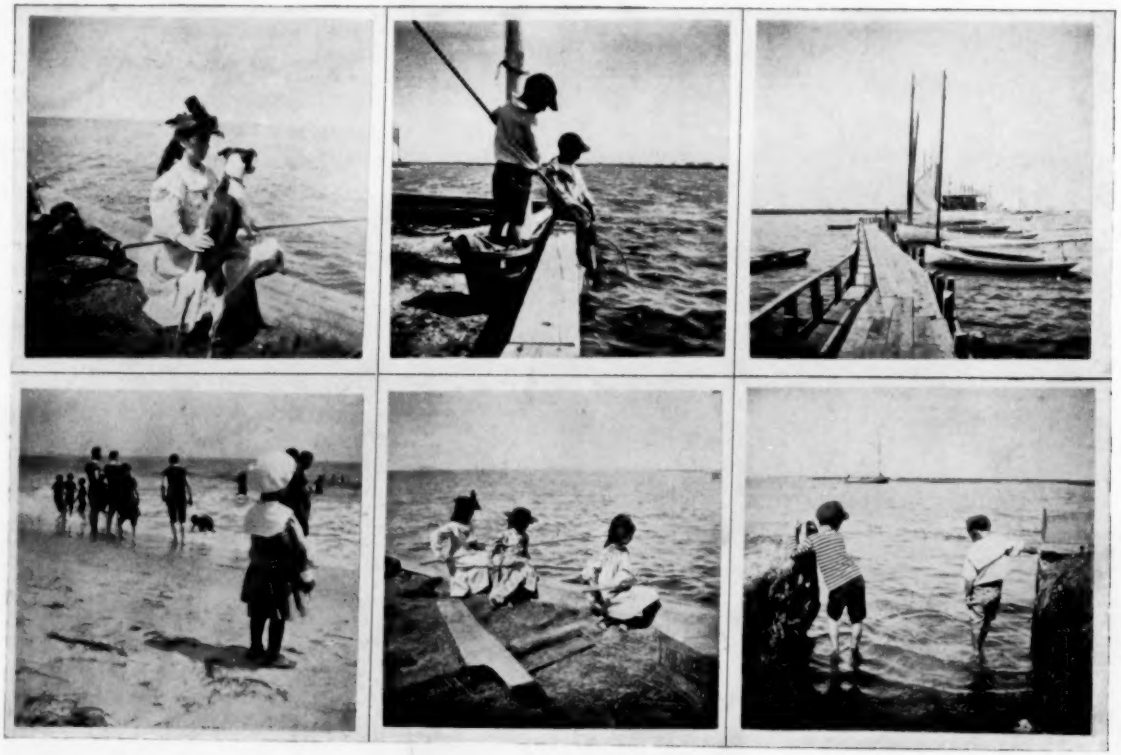
ments are these: First of all, you want a very high vacuum, as high a vacuum as the coil you are using will produce luminescence in; then you want to have the electrodes as far as possible apart; the tube must be of an uniform thickness of glass, so that it will not crack with the heat; and it is of paramount importance that it should be made of German potash glass, because that kind of glass answers much better than lead glass. These are the chief requirements, except that if you are going to do a large body you must have a large tube; and in order to get sharp definitions you must put that large tube a long way off, because, of course, this photography is merely by shadow, and you will get sharper shadows if you either have a very small luminescent patch from which the radiations are proceeding, or if you have that patch a long way off; small objects, of course, can be done with smaller tubes, and can be put nearer; coins, etc., quite near to the tube, because they are almost in contact with the plate; but the bones are fixed in the body, and you cannot put them nearer to the plate than the flesh will allow, and in that case it is necessary to have either a small tube, or a large tube a long way off.

[A number of lantern slides prepared from Mr. Swinton's results were shown at this stage.]

Little remains to say, except that it appears to me that this discovery is really of great importance. It is important for surgery, because it gives one a means of seeing the interior of a body in a way that has never been possible before. But it also seems likely to be of great importance from a purely physical standpoint. It appears to me that in the course of the next few years —half a century or so—there is sure to be some great generalism which will proceed from all the enormous amount of knowledge that at the present moment is being acquired upon all subjects. The amount of knowledge that has been acquired during this century upon scientific subjects is immensely greater than in all the previous centuries of the world put together. People are very fond of saying "So-and-so discovered this," and "So-and-so discovered that," and in many cases the people whose names are associated with certain discoveries deserve great credit. I would

not for a moment wish to minimize the credit due to Roentgen in connection with the discovery of which I have had the pleasure of showing you some illustrations this evening; but it must be remembered that Roentgen simply built upon a foundation laid by Lenard, Crookes and Hertz, Hertz by Clerk Maxwell, Clerk Maxwell by Faraday, and so forth. The ancient Greeks believed that Minerva sprang fully equipped from the head of Jove, but in this age we know better. We know that knowledge and the discoveries that make knowledge, do not proceed from single brains, but are subject, as everything else, to the law of evolution, and are the result of the cumulative workings of many minds.

The Camera in Jurisprudence.—From Chicago comes the story how one of the most important links in the chain that finally enwrapped Holmes was forged. This was the procurement of pictures of the three Pitezel children, Howard, Nellie and Alice—pictures whose publication broadcast in the newspapers had a very important bearing in unraveling the mystery that at that time surrounded Holmes and his operations. Mrs. Pitezel had been applied to, but she said there were no photographs of any of her children. It was here that the ingenuity and persistency of one of the representatives of the Fidelity Mutual Life Association came into play. Visiting Dessie, the oldest daughter, he asked her if at some time the children had not been photographed. "No," she replied, "we were too poor to have the children's pictures taken." "But were they never even taken in a group at school?" Dessie hesitated for a moment, and then said she was pretty sure the other three children had been taken in that way, but could not say that any of the pictures could be got at. The name of the school, the "D. S. Wentworth," was obtained, and, having secured the aid of the principal, the detective went patiently to work and succeeded in finally securing three groups, each of which contained a picture of one of the children. These he had enlarged, and the pictures which were published—excellent likenesses they are said to have been—led to most important results, and finally to the unearthing of the great crime for which Holmes is soon to forfeit his life.



SNAP SHOTS WITH BULLS-EYE CAMERA.

TAKEN BY ROBERT F. ENGLE,
BEACH HAVEN, N. J.

THE DEVELOPER IN OUR DARK-ROOM.*

THE developer at present provided in the dark-room for the use of our members, was introduced under the name of "The Good-enough," partly to conceal the fact that it was an old form of pyro developer (presumably objectionable on that account to the *fin-de-siecles*), and partly because it *is* good enough to perform any reasonable service required of it. This developer was devised by George H. Ripley, formerly a member of this Society, and while it is not claimed that it produces results much superior to the Beach pyro and Newton alkali combination so long in use, it is preferable to it on account of its more intelligent and simpler proportions and its dispensing with the aid of commercial sulphurous acid—which our custodian has found to be of very variable strength indeed. The "Goodenough" is made up in two parts, each containing 10 ounces of stock solution; and, as the quantity of each ingredient is divisible by 10 without a remainder, the whole may be reduced to the simple basis of one ounce by leaving off the right hand cipher. Again, the normal working solution is one dram of each, A and B, with water to make two ounces. As there are eight drams and drachms to an ounce, and the quantities of the principal ingredients are even multiples of eight, we see by the simplest mental arithmetic that in every two ounces of working developer there are

6 grains of pyro,
30 grains of sulphite of soda,
18 grains of carbonate of potash,

together with ¾ grain of citric acid and ⅜ grain of bromide of ammonium; the former exercising a preserving influence—ancillary to the sulphite—and the latter being a restrainer. The proportions are thus—one part of pyro, five parts sulphite, and three parts carbonate of potash—equal to about seven parts of sal-soda crystals.

To make up "The Goodenough Developer" mix in order named.

* Read before the Society of American Photography, of New York, February 1st, 1896.

A. Sulphite of soda (crystals), 3 oz. - (1.440 grs.)
Citric acid, 1 drachm - - - (60 grs.)
Bromide of ammonium, ½ drachm - (30 grs.)
in about 8 oz. water (distilled), then add
Pyrogallic acid, 1 oz. - - - (480 grs.)
and make solution up to 10 oz.

B. Sulphite of soda (crystals), 2 oz. - (960 grs.)
Carbonate of potash, 3 oz. - - (1.440 grs.)
in water to make up to 10 oz.

For use: for normal developer, take 1 dram of each (A and B) and water to make 2 ounces.

For soft effects, take 1 dram of each and water to make 4 ounces.

In practice it is seldom necessary to use as strong a solution as that given as the normal strength. It might, however, be used successfully on many plates where the exposure has been accurately calculated and where there are no harsh contrasts—say on open views having little foliage, or non-actinic colors, in the foreground. Generally it is preferable to go slower, and secure soft effects and gradation by using four ounces of water to one dram each of A and B.

For special subjects, including effects against the light, with luminous mists and atmosphere; for marine and bird's-eye views, where gray and violet tones predominate; where contrast is desirable and flatness disagreeable, it is better to make up two solutions, balanced against each other, somewhat as follows:

Solution I. 2 drams A.
½ dram B.
Water, 2 oz.

Solution II. 2 drams B.
½ dram A.
Water, 2 oz.

Soak the plate in No. I about two minutes, which time the plate may be kept from the light, as, unless the exposure has been abnormally full, there is little probability of the image flashing out and becoming unmanageable. Do not, therefore, strain your eyes to see the image, but gently rock the tray, occa-

sionally looking to see if the solution properly covers the plate. At the end of two minutes the image will probably only faintly show; now pour off solution No. I, and immerse the plate in No. II. This is the time to exercise your powers of observation and judgment. Frequently inspect the action of the solution; if the plate develops promptly and at moderate speed, finish in No. II. But if it comes up very rapidly, restore to the No. I solution for safety, and the development may be concluded by alternate baths of No. I and No. II. In cases of known extreme over-exposure a few drops of a ten per cent. bromide solution may be advantageously added to No. II—not so No. I, as that would tend to make a hard negative. This alternate system of development with two solutions is also recommended for all cases where there is uncertainty about the amount of exposure; for instance, the case of a batch of exposed plates, partly snap-shots and partly time exposures, where the record of the particulars has been lost. By this tentative method the control of the development is retained from beginning to end, and, while contrast may be secured, there is no danger of hardness if reasonable judgment is used.

In making up the developer, distilled or pure water ought to be used, which may also be heated to expel the air from it and to aid in dissolving the ingredients. The tap water in New York has been full of earthy, to say nothing of organic, matters this winter, and stock solutions made with impure water do not give satisfactory results or keep well.

Good development cannot be secured if the working solutions are too cold; 60 degrees F. is a good temperature, and it is a good rule to keep the solutions between the limits of 60 and 70 degrees F. A small thermometer would be a wise addition to the stock in trade of every photographer, and its use would reveal the cause of many puzzling failures in development and fixing. The fixing bath should receive more attention than it does. Plates do not fix quickly or completely in cold hypo baths, and many a negative has yellowed in time because it was placed in a freshly mixed, and therefore very cold, hypo solution.

APPARATUS FOR CATHOGRAPHY.

BY NIKOLA TESLA.

IN order to produce the most intense effects we have first to consider that, whatever their nature, they depend necessarily on the intensity of the cathode streams. Then again, being dependent on the magnitude of the potential, it follows that the highest attainable electrical pressure is desirable.

To obtain high potentials we may avail ourselves of an ordinary induction coil, or of a static machine, or preferably of a disruptive discharge coil. If we put two electrodes in a bulb, or use one inside and another outside electrode, we limit the potential, for the presence not only of the anode but of any conducting object has the effect of reducing the practicable potential on the cathode. Thus, to secure the result aimed at, one is driven to the acceptance of a single electro bulb, the other terminal being as far remote as possible.

Having selected the induction apparatus and type of bulb, the the next important consideration is the vacuum. On this subject I am able to make known a fact with which I have long been acquainted, and of which I have taken advantage in the production of vacuum jackets and incandescent bulbs, and which I subsequently found to be of the utmost importance, not to say essential, for the production of intense Roentgen shadows. I refer to a method of rarefaction by electrical means to any degree desirable, far beyond that obtainable by mechanical appliances (unless involving refrigeration.—ED.)

Though this result can be reached by the use of a static machine as well as of an ordinary induction coil giving a sufficiently high potential, I have found that by far the most suitable apparatus, and one which secures the quickest action, is a disruptive coil. It is best to proceed in this way: The bulb is first exhausted by means of an ordinary vacuum pump to a rather high degree, though my experiences have shown that this is not absolutely necessary, as I have also found it possible to rarefy, beginning from low pressure. After being taken down

from the pump, the bulb is attached to the terminal of the disruptive coil, preferably of high frequency of vibration, and usually the following phenomena are noted:—First, there is a milky light spreading through the bulb, or possibly for a moment the glass becomes phosphorescent, if the bulb has been exhausted to a high degree. At any rate, the phosphoresence generally subsides quickly and the white light settles around the electrode, whereupon a dark space forms at some distance from the latter. Shortly afterwards the light assumes a reddish color and the terminal grows very hot. This heating, however, is observed only with powerful apparatus. It is well to watch the bulb carefully and regulate the potential at this stage, as the electrode might be quickly consumed.

After some time the reddish light subsides, the streams becoming again white, whereupon they get weaker and weaker, wavering around the electrode until they finally disappear. Meanwhile, the phosphoresence of the glass grows more and more intense, and the spot where the stream strikes the wall becomes very hot, while the phosphorescence around the electrode ceases and the latter cools down to such an extent that the glass near it may be actually ice-cold to the touch. The glass in the bulb has then reached the required degree of rarefaction. The process may be hastened by repeated heating and cooling and by the employment of a small electrode.

I may state here that the experimenter need not be deterred from using a glass bulb, as I believe the capacity of glass as well as the transparency of aluminium are somewhat exaggerated, inasmuch as I have found that a very thin aluminium sheet throws a marked shadow, while, on the other hand, I have obtained impressions through a thick glass plate.

The above method is not only valuable, as a means of obtaining the high vacua desired, but it is still more important, because the phenomena observed throw a light on the results obtained by Lenard and Roentgen.

Though the phenomenon of rarefaction under above conditions admits of different interpretations, the chief interest centers on one of them, to which I adhere—that is, on the actual

expulsion of the particles through the walls of the bulb. I have lately observed that the latter commences to act properly upon the sensitive plate only from the point when the exhaustion begins to be noticeable, and the effects produced are the strongest when the process of exhaustion is most rapid, even though the phosphorescence might not appear particularly bright. Evidently, then, the two effects are closely connected, and I am getting more and more convinced that we have to deal with a stream of material particles, which strike the sensitive plate with great velocities. Taking as a basis the estimate of Lord Kelvin on the speed of projected particles in a Crookes bulb, we arrive easily by the employment of very high potentials to speeds of as much as a hundred kilometres a second.

It may not be known that even an ordinary streamer, breaking out suddenly and under great pressure from the terminal of a disruptive coil, passes through a thick glass plate as though the latter were not present. Unquestionably, with such coils pressures are practicable which will project the particles in straight lines even under atmospheric pressure. I have obtained distinct impressions in free air, not by streamers, as some experimenters have done, using static machines or induction coils, but by actual projection, the formation of streamers being absolutely prevented by careful static screening.

A valuable evidence of the nature of the radiations and progress in the direction of obtaining strong impressions on the plate might be arrived at by perfecting plates especially sensitive to mechanical shock or impact. There are chemicals suitable for this, and the development in this direction may lead to the abandonment of the present plate. Furthermore, if we have to deal with streams of material particles, it seems not impossible to project upon the plate a suitable substance to insure the best chemical action.

By exposing the head to a powerful radiation strange effects have been noted. For instance, I find that there is a tendency to sleep and the time seems to pass away quickly. There is a general soothing effect, and I have felt a sensation of warmth in the upper part of the head. An assistant independently con-

firmed the tendency to sleep and a quick lapse of time. Should these remarkable effects be verified by men with keener sense of observation, I shall still firmly believe in the existence of material streams penetrating the skull. Thus it may be possible to project a suitable chemical into any part of the body.

Since my above-mentioned discoveries I have made considerable progress, and can presently announce one more result of importance. I have lately obtained shadows by *reflected rays only*, thus demonstrating beyond doubt that the Roentgen rays possess this property. One of the experiments may be cited here. A thick copper tube, about a foot long, was taken and one of its ends tightly closed by the plate-holder containing a sensitive plate, protected by a fibre cover as usual. Near the open end of the copper tube was placed a thick plate glass at an angle of 45° to the axis of the tube. A single-terminal bulb was then suspended above the glass plate at a distance of about eight inches, so that the bundle of rays fell upon the latter at an angle of 45°, and supposedly reflected rays passed along the axis of the copper tube. An exposure of 45 minutes gave a clear and sharp shadow of a metallic object. This shadow was produced by the reflected rays, as the direct action was absolutely excluded, it having been demonstrated that even under the severest tests with much stronger actions no impression whatever could be produced upon the film through a thickness of copper equal to that of the tube. Concluding from the intensity of the action by comparison with an equivalent effect due to the direct rays, I find that approximately two per cent. of the latter were reflected from the glass plate in this experiment. I hope to be able to report shortly and more fully on this and other subjects.—*The Optician.*

It is a mean habit of mind that is forever looking for the failings of others. Lord Byron used to say that he could always tell whether he was being introduced to a gentleman or not. If he had a mean soul his eye would be sure to travel down to the poet's club-foot, and a man with a noble soul would be careful not to look at that.

THE THEORY OF EXPRESSION.

THE great trouble with most folks is that they don't understand what we may be permitted to desiginate *the theory of arrangement*, and results are constantly haphazard—sometimes good and sometimes bad.

Now, the human face represents certain defined rules of expression that can be literally followed in matters of picture-hanging. Thus:

When the lines, which form the mouth and eyes, remain paeallel with the lines of the nose, then the face is in what we should call repose; when the lines are lengthened to form downward angles, the face expresses joy; when lengthened to form upward angles, grief is depicted. Straight lines, as well as curved lines, produde the effect of solidity, durability and support. This is a constructive axiom, accepted from the earliest ages. On this

REPOSE, JOY, GRIEF.

ages. On this principle wainscotings, doors and mantels are bullt in straight and curved lines. Bui it wouid be manifestly wrong to furnish a mantle with ornaments, whose tops or proportions would give a rounding and straight effect, unless you desire such a room to be stiff and prim.

The popular tree, with its upshooting branches, forming down-pointing angles, has a look of cheerfulness about it, while the willow, with its drooping branches, forming upturned angles, produces quite an opposite effect, and in all countries typifies mourniug and sadness.

If, in putting up pictures, we see to it that lines from the tops of the different objects with which we are to decorate a mantel, form angles pointing downward, then the effect produced will be

cheerful. If the points of the articles point upward, the effect will be opposite.

Furthermore, we must avoid arithmetical progression. Suppose we were to hang three pictures of equal width, but of unequal height. The first, one foot long; the second, two; the third, three. We must not hang them according to their size,

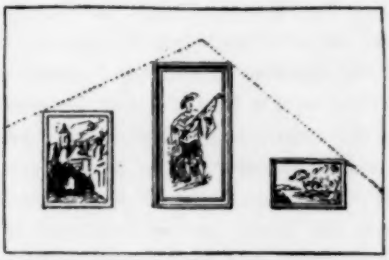


FIG. 2

because in this way the line would be no longer a broken line, but a straight one, losing thereby the property of life, and forming a regular and precise stairway. We should arrange them according to Fig 2. There is much to think about in this theory, and the more you think about it, the more you well agree that the principles here laid down are correct.

The rules applies to furniture also. A high easel arranged

DIGNITY AND SEVERITY. IRREGULAR AND GRACEFUL.

with a chair upon each side gives an upward angular tendency, which is undesirable. The placing of one chair by the side of this easel would give a neutral effect and all right, and the other chair could be placed elsewhere, but the arrangement of everything to be cheerful should preserve a down-going angle aspect. —*Picture Arts.*

THE PHOTOGRAPHIC NATURALIST.

J. VINCENT ELSDEN.

Photography and Vulcanology.

THE careful series of drawings made in 1767 by Sir W. Hamilton to illustrate the building up of the cone of Vesuvius, would have been far more complete if photography could have been employed to supplement the hand sketches. It was not, however, until the eruption of 1872 that any extensive series of photographs of this interesting volcano were made. In that particular series we have illustrations of the lava streaming down the flanks of the mountain, together with clouds of steam and dust rising from the crater to the height of 20,000 feet. Dr. Johnston-Lavis is now able, by almost daily photographs of Vesuvius, to chronicle the rapid changes which it undergoes, as well as the aspect of the crater both before and after an eruption. Some valuable information has also been secured in Hawaii by means of a series of photographs taken at short intervals during the advance of a lava stream.

In the library of the British Museum will be found a book published in 1856 by Mallet, and illustrated with a series of photographs, taken by that famous vulcanologist himself, to illustrate the various phenomena produced by the Naples earthquake; but photography has more recently been employed in the far more delicate study of earth tremors or seismology. In 1887, Fouqué and Michel Levy made a series of experiments on the rate of transmission of earth tremors. A reflected beam of light from a mercury dish was focussed on a sensitive plate revolving in the path of a lens. In the absence of any earth movement a circle was produced on the plate, but the smallest vibration caused a widening of the circumference, indicating the beginning, duration, and end of the shock.

A photographic tremor recorder or seismograph was described in 1892 in the *British Association Reports.* A beam of light from a vertical slit was made to pass through a lens to a mirror, and

thence to a horizontal slit behind which a photographic plate moved vertically by clockwork. Continuous daily observations were taken on plates, twelve inches long by two and a half inches wide, moving slowly in twenty-four hours across the slit. By a more rapid motion even tremor storms were indicated. Professor Milne used a similar method, by connecting a galvanometer to a deep well, to record changes of electric potential in the earth during the progress of an earthquake. The frequent Japanese earthquakes have given Professors Burton and Milne an opportunity of securing photographic records of the utmost value in the study of seismology.

In connection with this subject, it may be mentioned that the ordinary seismograph records on smoked glass are conveniently copied for permanent preservation upon cyanotype paper.

Subterranean and Submarine Photography.

The first subterranean photograph was taken in 1865, and shown to the British Association by Mr. A. Brothers. It was a view of the Cupola Cavern, Blue John Mine, Derbyshire. In the same year the first coal-mine photograph was secured by Jackson Bros. of Oldham, and Piazzi Smyth photographed the interior of the Egyptian pyramids. All these, as well as Anthony's series of photographs of the Mammoth Cave, accomplished in the following year, were taken by means of magnesium ribbon.

Since the introduction of modern dry plates, the facilities for subterranean photography have greatly increased. Sopwith's series of photographs, illustrating coal mining, were obtained in 1881, the light from burning magnesium ribbon being concentrated by parabolic tin reflectors. Both coal and metalliferous mining have lately been well illustrated by Messrs. Burrow and Hughes, whose experience has been chronicled in papers read before the Royal Photographic Society and elsewhere. The peculiar difficulties of this department of photography are well shown by the fact that less than twenty per cent. of the negatives taken by them were good, and seventy per cent. were complete failures. The difficulties arise chiefly from the imperfection of illumination, especially in coal mines. The smoke from blasting and the

moisture of the atmosphere are also obstacles to success. The woodwork of the apparatus becomes swollen and stiff, while the lens becomes rapidly dimmed by condensed moisture, and must be examined immediately before exposure. A preliminary rubbing of the lens with glycerine diminishes this evil. If magnesium ribbon is used for the purpose of viewing the picture before exposure, care must be taken to let the smoke clear away before uncapping the lens. Focussing is better done by means of candles placed in various positions in the field of view. The lens which Mr. Burrow found most suitable was the Zeiss anastigmatic, *f*-7·2, and for confined spaces the Ross concentric, *f*-22.

As regards underground lighting, the following are some of the advantages and disadvantages of the ordinary artificial illuminants:

1. *Electric Light.*—The arc light gives good results, but is seldom available. It is not suitable for miners at work on account of the long exposure necessary. A sheet of white paper behind the light forms a good reflector and relieves the half-tones. Incandescent lamps have been proved to be useless for underground work.

2. *Bengal Fire.*—This gives a brilliant white flame, but the fumes discolor stalactites, and the sulphurous smoke not only dims the atmosphere but is dangerous to inhale.

3. *Magnesium Ribbon.*—The light from this source is somewhat uneven. A long exposure is necessary, and a heavy smoke is produced, which is of great inconvenience where there is bad ventilation. It is better when burnt in oxygen gas.

4. *Flashlight Powder.*—Most of these powders are dangerous to use, as they explode on percussion and give irrespirable combustion products. The following composition has been recommended as giving an intense light, visible at a distance of 100 kilometres: Magnesium powder, 20 parts; barium nitrate, 30 parts; flowers of sulphur, 4 parts; and beef fat, 7 parts. The fat is added in a melted state to the mixture and cooled in zinc boxes. A charge of half a kilogramme burns for twenty seconds.

5. *Magnesium Powder.*—This is the safest of all flashlights,

giving but little smoke, and requiring but a short exposure if burnt in a suitable lamp. Messrs. Hughes and Burrow prefer the Platinotype Company's lamp. Magazine flash lamps are now to be had containing enough powder for twenty ordinary flashes. By this means successive flashes can be given if necessary from different positions to relieve the shadows. A large quantity of the powder should be used for each flash to secure full exposure.

Of course only the quickest plates should be used, and development should be slow, with a diluted developer to avoid hard contrasts. It has been suggested that, for proper illumination, the greater source of light should be placed at a short distance on one side of the camera, and a lesser source, or shadow softener, above the lens. To prevent smoke and ashes from being thrown in front of the lens, a lamp with a vertical flame, rather than a horizontal one, is to be preferred.

Submarine photography has not been very extensively practised, although various efforts have been made to accomplish this end. In 1866, M. Bazin described a complicated arrangement for photographing the sea bed. It consisted practically of a diving bell, from which the operator took photographs, by electric light, through strong glass windows. More recently, M. Bontan, of Paris, has obtained excellent photographs of the bottom of the sea, by means of a submarine camera, consisting of an ordinary hand camera enclosed in a watertight metal box, with plate-glass sides. In shallow water ordinary daylight suffices, but in deep water the operator descended in a diving dress, and used the magnesium flash light. A blue glass screen in front of the lens was found advantageous.

An ingenious contrivance for finding the direction of submarine currents and their temperature was submitted in 1874 to the Berlin Geographical Society, by Dr. Neumeyer. The camera consisted of an hermetically sealed copper box, containing a thermometer and a compass needle. The box had a rudder attached to it, causing it to lie with the current, while at any given moment the temperature and compass bearing could be imprinted on a sensitive surface by means of an electric arc light. These experiments are of interest, when we remember the great diffi-

culty surrounding all submarine observations and the persistence with which the resources of photography are employed to overcome natural obstacles.

Museum Photography.

There is at the present time a growing tendency to illustrate geological text-books with process blocks made from photographs of selected museum specimens. In order to make such reproductions really effective, great care is necessary in arranging the light and shade. In general, a vertical aspect is necessary, for which purpose the special stand with glass platform, described in a former article,* will be found convenient.

Quite recently, Messrs. Sharp & Hitchmough have manufactured a special museum stand and camera to meet the requirements of the Liverpool Museum authorities. The stand is meant for use, not only in the museum but also in certain cases in the field, where fossils or minerals are required to be represented *in situ*, in awkward positions for the ordinary camera. It can be used with equal facility for photographing objects in a horizontal plane, either above or below the level of the camera, the camera itself retaining its normal position. A forward extension enables the lens to be brought directly over fixed show cases, and a prism placed between the lenses enables objects in the horizontal plane to be readily accessible. An adjustable glass platform, with a reflector below, is useful for supporting solid objects, without the danger of cast shadows, and at the same time, allowing backgrounds of suitable color to be employed. This apparatus possesses all the advantages of the vertical camera, previously described, without the inconvenience arising from the difficulty of focussing in the vertical position.

The vast collections of splendid specimens of minerals and fossils stored up in our museums would be rendered of far greater educational value if such a camera were at the disposal of those wishing to secure either book illustrations or lantern slides for lecture purposes.

* *The British Journal of Photography*, vol. xlii., p. 42 (January 18th, 1895).

All photographs of minerals or fossils should possess some simple means of estimating their natural size, either by an attached scale, or by placing by the side of the specimen some familiar object of known magnitude.

In many cases a known distance can be marked on the specimen itself by means of two small discs of white paper, while paper arrows properly disposed can be used to direct attention to any special feature which the specimen illustrates.

Photographs of Rock Sections.

The quantitative mineral analysis of a complex rock by chemical means is at all times a difficult process, and often quite impossible. A ready means of arriving at an approximate result, however, when not too fine grained, is afforded by the simple device of photographing a thin transparent section of the rock.

After cutting out the various crystals from a paper positive and sorting them, their relative proportions can be determined by weighing the different samples. This is more accurate than the plan advocated by Delesse of drawing the outlines of the crystals by means of the camera lucida.

To photograph a rock section, it often happens that only a moderate enlargement is necessary. A microscope need not then be used, as a magnification of from two to five diameters is readily obtained by the ordinary camera in conjunction with a wide-angle lens. A symmetrical lens of short focus, about two inches, for instance, answers very well, as did the small Petzval postage-stamp lenses of an inch and a half focal length formerly in the market. A long extension or lengthening cone is necessary. In the absence of a lens of sufficiently short focus, the best plan is to obtain a photo-microscopic attachment for the camera, consisting of a simple arrangement to carry the objective, and an adjustable stage for the rock section. For illumination the ordinary microscope lamp will do when low powers only are used.

Sometimes a better contrast is obtained in photographs of rock sections by using the polariscope, in which case isochromatic plates and monochromatic light are beneficial. Occasionally it may be found that a rock section is too coarse and opaque to

give good results on magnification with the camera. In this case the section can itself be used as a negative, and a print obtained by contact on sensitive paper or on glass, and from this the positive picture can afterwards be prepared and enlarged to any size.

It is not proposed here to enter into the domain of photomicrography proper required in more advanced petrographical work with high powers, as this subject can be more conveniently treated in a subsequent article.

Conclusion.

Probably there are few geologists who have not had occasion to regret either the loss of time involved in making hand sketches of interesting geological subjects, or, what is still more important, the inadequacy of the result to represent the desired effect. In photography we have a simple means of overcoming both of these difficulties. But the value of a geological photograph is largely increased if it is accompanied by an outline hand sketch, showing the details intended to be expressed. This is done with great effect in the geological photographs displayed in the Museum of Practical Geology in London, which also illustrate in a striking manner one of the great advantages of a photograph over a hand sketch for educational purposes. Hand sketches show only that to which attention is desired to be drawn. Whether it be a fault, a contortion of strata, or an igneous dyke, a single glance is enough to reveal the whole object of the drawing. The consequence is that a student is disappointed on first commencing field work to find nature not so plain as the diagrams in his text-book, since the features he is looking for are often obscured in the field by a mass of secondary detail, which he only learns how to eliminate by practice. With a photograph the case is different. The eye has to search the photograph for the required feature as diligently as the field geologist searches the face of the cliff or the side of the cutting, and the student derives from the study of photographs a preliminary practical training which is invaluable in his future field work.

But another advantage often to be derived from the study of geological photographs places them in one respect even before

nature herself. Structures which easily escape notice in the field are brought into prominence when condensed by the lens into the small area of a photograph. In this way minute contortions, the angles of intersection of jointing planes, the angle of dip of strata, the presence of obscure bedding planes, and other important features, are more accurately detected in a photograph than in an actual section. Perhaps the question may arise in some minds as to what is a geological photograph, and how may it be known to be worth preservation. In one respect all photographs of natural objects are geological photographs, and it is impossible to say how soon a photograph, now about to be discarded, may prove of inestimable value to science. Change and decay are going on around us in the inorganic as well as in the organic world. The agencies of denudation rapidly alter the aspect of the country; interesting sections become overgrown with vegetation or buried by the *debris* of a winter's frost; volcanic forces destroy the shapes of mountains and visit even men and cities with sudden destruction; fossils found perfect *in situ* become broken during extraction, or perish subsequently in the museum or cabinet, from the oxidizing action of the atmosphere. No natural feature can be looked upon as lasting, and science calls aloud for the duplication of valuable evidence while there is yet time. It is true that photography is as yet too young a science to have proved the absolute superiority of its records to the ravages of time; but we have photographic processes at our command which, if they do not give us imperishable results, are at least more permanent than the mountains and the plains, and which possess, moreover, the inestimable advantage, the power of being reproduced.

British Journal of Photography.

Counting Seconds.—A bunch of keys, knife, stone, bullet, etc., or any small, heavy object at the end of a string, between 39 in. and 40 in. long, will swing once each way in a second. Or, if the string be just short of 10 in., each journey takes half a second.

DARK LIGHT PHOTOGRAPHY.

THE results obtained by Professor Roentgen, in photographing without light should have been predicted long ago as likely to follow from certain well established physical facts.

The phenomena of vision are purely physiological, while those of photography are purely mechanical. The relation of vision to visible photography is purely accidental; there is no necessary connection between the two. The organs of vision in man are capable of producing in the brain the sensation of vision only when acted upon by ethereal waves, whose lengths are between .00036 and .00081 millimeters. This is undoubtedly due to the fact that substances composing the humors of the eye are easily penetrated by these waves, while all waves shorter or longer than these give no sensation. Glass, air, water and other so-called transparent substances have a similar quality of transmitting waves of about the same range in length. When such substances are interposed between the eye and a source of ethereal waves, ranging between .00036 mm. and .00081 mm. in length, the waves are practically unobstructed and pass through to the eye. It is this accidental circumstance that enables us to distinguish between transparent and opaque substances. The range of human vision, and consequently ordinary transparency, is a very narrow one, but the fact that certain animals, particularly insects, are more active in darkness, and have visual organs entirely different from man, shows that their visual range is probably much greater. Waves which we recognize as heat may produce in such animals a sensation of light. The discovery of photography, but not photography itself, did depend upon the accidental circumstance that iodide of silver undergoes a rapid chemical change when acted upon by waves of light including and extending beyond the range of physiological sensibility. Had these chemical changes been produced by waves entirely out of the range of human vision Daguerre could not have investigated the matter as he did. The first step in photography was the discovery that visual light caused this chemical change in iodide of silver; the second step

was to fix in permanent position the portion of the substance changed by the light while the unchanged portion was removed. From what is known as chemical combinations it seems highly probable that numerous compounds may exist, which are sensitive in the same way to waves entirely different in length from the visual ones. It has long been known that the range of wave lengths producing effects upon salts of the silver is much greater than the visual range, and also that the wave lengths which produce the maximum physiological effect (light) are not the same as those producing the maximum photographic effect. Glass is opaque to very short waves, its limit being nearly coincident with the visual limit, while quartz is transparent to a range of short waves, extending far beyond this limit. The reported discovery by Professor Roentgen of a method of photographing by waves of a range to which glass and the human eye are perfectly opaque, and to which metals and the human flesh are transparent, waves which he has been able to produce by means of an induction coil, is not only reasonable, but capable of explanation without the creation af any new mediums. The living tissues of the jellyfish are transparent to waves in the range of human vision and it is not unlikely that ordinary animal tissues are transparent to waves of some other length. The problem of photograping the bones in a living hand is that of finding a substance that will undergo a permanent chemical change only under the influence of ethereal waves of such lengths that flesh is transparent to them, while bone is opaque, and of finding an apparatus capable of handling these waves. If the discovery be confirmed we cannot fail to accord the highest praise to this new triumph of science, and to predict the development of a new field of actinography that may prove of greater importance than photography.—*Electrical World.*

Another craze in newspaper illustration at present is the Roentgen X-ray. The artists are working it for all it is worth, and more, too. We wish it could be utilized to photograph the conscience of the dead beat advertiser and subscriber who pays no attention to dunning letters.—*Publishers' Guide.*

PHOTOGRAPHY IN THE LAW COURTS.—A CURIOUS CASE.

THE value of photographs as evidence in the law courts is now so fully recognized that some classes of cases seem to be but rarely decided without these silent witnesses. In cases in which questions of light and air or ancient lights are involved, they are almost sure to institute an important part of the matter brought forward in support or defence of the claim, and, occasionally, there are some very amusing instances of cross swearing, if we may apply the term to inanimate witnesses whose evidence is graphic and not verbal. The photographs of one side, for example, taken with a wide-angle lens, appear to be conclusive one way, until others, taken under different conditions, afford conflicting evidence. In the court over which Sir Francis Jeune presides, the identity of the erring one is not unfrequently established by means of the cabinet or carte, which possibly may have served as a love token in days when the couple whose disunion is under discussion were united in heart. Only a few days ago, in a case in which an accident which had taken place was alleged to be due to the bad condition of a road through which a tramway was laid, the proof afforded by a photograph of the roadway, taken immediately after the accident, was sufficient to decide the case in the face of the fact that some half a dozen or so witnesses had sworn that the road was in good condition.

But perhaps one of the most curious cases in which photography has played a part was one that was decided last week at the Manchester sittings of the Chancery of Lancashire, and the curious point is that the proof of the use of a certain article in the manipulations of a photographic process long since lapsed into desuetude—the daguerreotype process—was sufficient to upset a modern patent which, but for this unearthing of this example of the ingenuity of the ancients, might have held its ground. In the case referred to, Messrs. Jones Bros. and Co. sought to restrain Messrs. Joseph Hallwork Bros. from infringing their patent in the manufacture of polishing cloths, sold under the

trade-mark of "Selvyt," which, as most people know, are most efficient for the purpose for which they are intended, and to the ordinary observer appear to be made of some species of velvet or velveteen. The plaintiffs relied upon their patent of 1891, and the defendants' case was that velvet or velveteen was known and used as a material for polishing prior to 1891. As far as the defendants' case had gone up to the examination of the witness whose evidence unexpectedly caused the case to collapse, the evidence, as given in the published reports, does not appear to have been very strong. There was some evidence that the cloths in question were identical with that substance known in the trade as "dressed off" velveteen, whatever that may mean, and there was the evidence of cabmen and others that prior to 1891 they had used velveteen cuttings for polishing their lamps and the metal work of their cabs, and for similar purposes; but the hero of the fight produced a book dated 1849, in which the manipulations of the daguerreotype process were explained, and in which the silvered copper plates were directed to be buffed with well-washed, unbleached, cotton velvet, and the witness, from his experience of the trade, took this to mean dressed-off velveteen. At this stage of the proceedings the court adjourned for luncheon, and on their return the plaintiffs' counsel, no less an authority than Fletcher Moultin, Q.C., stated that this evidence had entirely taken him by surprise, and that in face of it the plaintiffs had no alternative but to withdraw their claim.

The means by which wind may be measured by sound is a novelty in modern scientific research to which the attention of the National Academy of Science has been drawn by Prof. Barns. He asserts that the whistling of the wind as it crosses a wire varies with the velocity, and that this can be computed from the pitch of the note observed in case of a given diameter of wire and for a given air temperature. A special micrometer attachment can be made to convey the sound, isolated from other noises, to the observer at a distance. Thus, every gust and variation of the wind can be studied in this way, and an idea of the actual direction of the gust can be had by means of the sounds obtained from three wires placed at right angles to one another.

A PRACTICAL CAMERA CLUB.

Of the many photographic societies scattered throughout the world England leads in point of numbers, the great majority, however, if not almost all, being of an amateur or social character. The same may be said about the American societies in the United States and Canada, who stand next in order of numerical strength.

It is, however, to Germany, which stands third on the list, to which we have to turn for the ideal photographic society in the fullest sense of the word and all that it implies. We here find a series of societies composed in almost every instance of practical professional photographers, with a possible small percentage of the lay element, presided over by officers about whose scientific attainments there can be no question.

The stated meetings of these *Photographen Verein* are not merely social gatherings, nor held for the purpose of giving Professor Amidol Knowitall or Dr. Oxalate Itoldyouso an opportunity to display his knowledge by reading as his own some paper or lecture previously published elsewhere. On the contrary, these stated meetings are gatherings where professional and scientific photographers exchange ideas and compare results and experiences, for the mutual good and improvement of the photographic field at large.

In fulfilling their mission in the interest of photography and the photographic bread-winner, the German photographic societies do not confine their discussions to scientific problems or theoretical formulæ and practical manipulations, optical, chemical or mechanical, but whenever necessary they enter into an investigation of the immediate relationship of the employer and the employee, as well as the former's business affairs, should he pursue a course which would tend to bring into disrepute the art-science or deceive the public at large.

A case of this kind has just come to the notice of the writer. In the old Saxon city of Magdeburg on the Elbe, a certain photographer G——— it appears has for some time not only been deceiving the public by advertising himself as a *Hof-Photograph*, but also contrived a scheme for fleecing his employees. Three distinct charges were brought against this man, before the *Magdeburg Photographen Verein*, and resulted in an indictment being found against him in the local courts, which without doubt will mete out the proper amount of Saxon justice to the offending photographer.

A full statement of the charges was published in the *Deutsche Photographen Zeitung*, warning all persons against the culprit.

The first of these charges gives a curious insight into the course of duties this *Herr Hof-Photograph* subjected his industrial apprentice to, as necessary to become a first-class photographic artist.

The lad in question was the son of a soldier's widow, who had been placed in the military orphanage at Potsdam, whence the Magdeburg photographer took him upon an indenture to instruct him in the secret arts and mysteries of professional portraiture.

After a year or more of service the mother appealed to the society to aid her in an effort to have the papers cancelled and release her son, as the lad, she claimed, was not receiving the requisite amount of photographic instruction necessary for his future success. Further, that as a matter of fact the master was not a practical photographer, but by trade a bookbinder. All of which was denied by the employer upon his part.

In the subsequent investigation by the society it appeared that almost the whole of the lad's time was utilized in the performance of domestic duties, and that he rarely got into the studio or operating room except to scrub or clean the rooms.

The daily curriculum appears to have been as follows: Arise early in the morning, before the family, and make coffee for master and mistress who were yet in bed, then blacken boots and shoes, and clean up, peel potatoes for breakfast, then wash dishes, attend mistress to market, prepare vegetables and help around house; after dinner darn stockings and prepare supper; in the evenings his duties were to take care of the children, often as late as one o'clock in the morning, while master and mistress were out at a concert or beer-garden.

Worse than all it was charged that the apprentice was sent out to obtain goods on credit from local dealers and have them charged to some other person. The whole evidence further went to show that the apprentice was in fact kept solely for domestic and menial purposes, with nothing to indicate that any instruction in photographic processes or manipulations were given.

The other two charges were equally serious as they charged false pretense and an attempt to swindle.

We may well say to our photographic brethren of the old fortress city on the Elba, Well done brethren, continue in your good work, and purge the lists whenever you can.

J. Focus Snappschott.

The Editorial Dropshutter.

Photo-Sciograph of the Human Skeleton.—One of the latest marvels in photo-sciography thus far recorded is the successful experiment made at the University of Pennsylvania to obtain a sciograph of the full frame or skeleton of a full-grown adult. In this experiment two 16x20 plates were used; these had been prepared according to the suggestions made by the writer*, in his remarks before the American Philosophical Society, February 21st, 1896. For this experiment the plates were placed flat upon the table, being well wrapped in a rubber cloth, to exclude any light. The operator then placed himself upon the plates, the fluorescent tube was adjusted about twenty-four inches above the body; the current was then turned on and an exposure of forty-five minutes was made. The result indicates that less time would have sufficed, as the bones in the centre show but faintly, the ribs where they join the vertebræ being most plainly marked. Being much thinner than the vertebræ and bones of the arm they would naturally have been more easily penetrated by the rays, and some indistinctness would also arise from the constant rise and fall of the breast in breathing. Some distortion of the ribs is shown near the neck, owing to the nearness of the tube to them, and the distance of the ribs from the plate. The lower plate includes the lower part of the body, showing the entire pelvis, the hip joints, and a portion of the thigh bones. The clearness with which the shoulder joints, collar bones, pelvis, and other portions of the anatomy are shown emphasizes the value of the new process for the future. Further, the marked success attending these first efforts to photograph so large a portion of the human body gives promise of still greater results in the future, as the new energy becomes more known. The tube used in this experiment was a modification of the English tube, but much larger. It has a four-inch bulb, with a branch on each side, through which the electrodes are introduced, each electrode being covered with a blue enamel. One electrode is an aluminum disc placed at one end of the tube, and the other electrode terminates in a platinum disc, about one inch in diameter, placed at the centre of the tube and at an angle of 45 degrees to the disc first named. The tube is exhausted to about one millionth of an atmosphere, and has been now in use pretty constantly for three weeks, during which time it has improved in efficiency.

* American Journal of Photography, p. 120, supra.

The Thornton-Pickard Shutters which have lately been introduced into America are gaining ground at a rapid rate. The Time and Instantaneous is the one that will probably receive the most attention. It is valuable for all round work, whether for time exposures or rapid instantaneous, while the Focal Plain is more especially adapted for the expert photographer and affords a speed of one one-thousandth part of a second. The noiseless Silent Studio is the most recent of this remarkable series, and operates as the name indicates, noiselessly, for studio use.

The 1896 catalogue is now ready for distributron, and has some remarkable photographs illustrating the establishment of the firm and the various departments of their extensive works. It also contains many matters of interest to the professional and amateur.

The Hancock Statue.—The statue of General Hancock, erected by the national government at Washington, will be unveiled on the 12th of May with ceremonies commensurate with the occasion under the auspices of the national authorities. The original appropriation for the statue and pedestal was $50,000. Some time in 1891 competition was invited for plans, and $1,000 of the appropiation was paid out on that account. In April, 1894, a contract was made with Mr. Ellicott, and he erected the statue now in position. The amount to be paid Mr. Ellicott is $49,000, the total amount available. A prominent place on the platform has been reserved for the relatives of General Hancock.

A Successful Artist.—Philadelphia has reason to be proud of the fact that one of her most talented daughters, Miss Ida Waugh, has just been awarded the Norman Dodge prize of $300 at the exhibition of the New York Academy. The award is made for the best picture painted by an American woman, and was deservedly bestowed upon Miss Waugh for the portrait of Dr. Paul Sartain, of this city. Miss Waugh is not only pre-eminently successful in painting extremely life-like and faithful portraits, as those of Dr. Sartain and the late Mr. Richard Vaux give evidence, but it may be remembered that she has scored a marked success in the highest and most difficult of wonders, historic composition, in her picture, "Hagar and Ishmael," which created much favorable comment in Paris some years ago, and is now the property of the Philadelphia Academy of Fine Arts.

Copyright Litigation.—Hanfstaengl's litigation over the living pictures has come to an end in the English courts. He is a Munich art publisher, and complained that his copyright was infringed by the

representation of the pictures he owns. He sued the Empire for imitating the figures in the paintings with its actors and lost; he sued some illustrated papers for reproducing the Empire pictures, appealed the case to the House of Lords and lost; he finally sued the Empire for copying the backgrounds of certain pictures, lost the case for nearly all, but has his claim allowed for two, "Charity" and "Night," and received $8 damages and $2.50 for every time that these two pictures are represented.

Rays for all Surgery.—After performing a successful surgical operation with the aid of the X rays or radiograph at the University Hospital, Philadelphia, Dr. Arthur W. Goodspeed made a statement of remarkable significance concerning the adaptability of the new process of photography to all classes of surgery. The subject of the operation was W. A. Dasy, who was accidentally shot in the hand some time ago. The bullet was readily located by Dr. Goodspeed by means of a radiograph taken in an exposure of only fifteen seconds. It was a clearly defined picture, such as would, until very recently, have required from thirty to sixty minutes' exposure. After the operation had been expeditiously performed Dr. Goodspeed exhibited another remarkable radiograph which he had taken of a hand. In it were clearly defined the shadows of forty or more small shot, every one of which can be removed without any such mincing or mutilation of the hand as would have been necessary if there had been no radiograph of the wounded member. "The X rays," said Dr. Goodspeed, "can now be applied to nearly every surgical operation with positive and practical benefit, and I think that the rays will be used as a matter of course previous to every surgical operation. The field is practically unlimited."

Jefferson Hospital Philadelphia.—The X rays are beginning to assume a very important position in the field of surgery, even at this early day in their development. They are now used in a great many difficult surgical operations, and students are being trained with the possible benefits to accrue from this wonderful discovery in view. Among the enterprising young students who have taken up this branch is a young man named Thatcher, a second-year man in Jefferson College. He has secured a very valuable apparatus, and with it has taken innumerable photographs of the hands, feet and spinal columns of his friends. The other day he succeeded in locating a bullet in the hand of a colored man. In this instance the bullet could easily have been located without the aid of the X rays,

but the opportunity was too good to be lost, and a clearly defined photograph was the result. Next season the college will add the X rays as a branch study.

The New Edison Phonograph.—The strange case of an inventor buying back his patent rights is illustrated in the case of Mr. Edison, who has recently purchased from the receiver the rights and property of the North American Phonograph Company. It is Mr. Edison's intention to manufacture the phonograph himself. He has, however, made an important improvement, which is the invention of a motor operated by a spring power of a sufficient capacity to run two standard cylinders at one winding. This motor will overcome the difficulty frequently experienced in obtaining current to operate the electric motor previously employed for running the apparatus, and at the same time will reduce first cost of the phonograph very considerably.

In a paper published in the *Astronomtsche Nachrichten*, Dr. See shows how, by a very ready method, determination may be made of the absolute dimensions of the orbits of bright and rapidly revolving binary stars by single spectroscopic measures of the motions in the line of sight of the component stars, and from the dimensions and other known data of the orbits the actual masses of the stars and their distances from the earth can be easily calculated. But perhaps the most important result claimed for this method is the means it furnishes of testing the question whether the Newtonian law of gravitation applies to stellar systems as well as to the solar system. Dr. See shows the manner in which may be calculated the motion in the line of sight in all parts of the binary orbit, these calculations being based upon the law of gravitation and a single spectroscopic measure. If such measures be continued upon a number of pairs, while the stars complete their revolutions, and the computed and observed motions in the line of sight agree throughout, within reasonable limits of error, it will be strong proof of the universality of the Newtonian law.

Make yourselves nests of pleasant thoughts. None of us yet know, for none of us have been taught in early youth what fairy palaces we may build of beautiful thought, proof against all adversity. Bright fancies, satisfied memories, noble histories, faithful sayings, treasure houses of precious and restful thoughts which care cannot disturb, nor pain make gloomy, nor poverty take away from us—houses built without hands for our souls to live in.—*Ruskin*.

Photographic Hints and Formulæ.

To Remove Varnish from a Negative.—Place the negative in a porcelain, or glass, or vulcanite, but *not* celluloid dish. Cover with methylated spirit and rock gently, and cover over with a bit of card to prevent needless evaporation and smell. After, say, five minutes, rub with a tuft of clean cotton-wool. If the varnish is not entirely removed, add a little more spirit and a few drops of strong ammonia, rock gently, and again rub with the plug of wool. After all the varnish is removed, rinse in clean methylated spirit and blot off with clean blotting, again rinse with spirit, and dry spontaneously.

A Practical Mounting Hint.—When mounting wet prints of any kind, and rubbing them down with blotting paper, the blotting soon gets damp and rubs either to a fluff or into holes; to prevent this, have next the hand and along the top piece of blotting a piece of thick highly glazed paper, or a piece of thin and smooth American cloth. In either case the hand moving along a smooth surface does not have the tendency either to make fluff or holes.

Centennial of Lithography.—At a meeting of the Lithographers' Association, in the Bourse, Philadelphia, the following officers were unanimously elected: John D. Avil, President; James L. Ferguson, Vice-President; Arno Leonhardt, Secretary and Treasurer; Executive Committee, L. R. Bergman, William Hart, G. Hofstetter, W. H. Jarden and E. Y. Landis. President Avil appointed Messrs. Leonhardt, Bergman, Hofstetter and Howard Duncan on the Entertainment Committee, and it was suggested that the centennial of lithography in June, 1896, be commemorated with a banquet. It is also intended, if practicable, to hold an exhibition of lithography, and efforts are to be made to obtain exhibits from the Grolier Club, of New York, and from the Drexel Institute, Pennsylvania Museum, and School of Industrial Art of Philadelphia.

A Chemical Proof Lining for Tin Trays.—Tin trays coated with the following mixture are said to be perfectly chemical proof, and to resist the action of hot water etc., equal to a porcelain tray:

Brewer's pitch	1 ounce.
Paraffine	5 drachms.

Heat the mixture until it melts, then warm the tray to be coated, and brush the liquid evenly over the whole tray and set it aside to harden.

To Render Focussing Screen More Translucent.—In copying a drawing, engraving, etc., where there is not very much light, and it is important to get a sharp focus, it will be found helpful to have a ground-glass stopping very little light. For this end a few drops of glycerine rubbed well into the grain of the ground side, and all superfluous glycerine removed with a clean piece of rag, gives a very comfortable screen for this kind of work. A compound eye-piece must be used of course. If glycerine is not at hand, oil or vaseline may be used.

Color Photography.—A method differing radically from those hitherto employed, has been devised, and is interesting for its novelty, and is seemingly practicable. The plan is to have the color on the sensitized paper before printing—red, green and blue lines ruled in alternation, 300 or more to the inch. A sheet of paper thus prepared appears faintly tinted, and would almost pass for white. The negative is made behind a colored screen, ruled in exactly the same way. Superimposed upon the paper in perfect register, the negative is then used for printing, and, owing to the chemical action which ensues, the color is fixed wherever the light falls, and may be dissolved off from those spots upon which the light has not fallen.—*Yale Scientific Monthly for March.*

Practical Hints.—An English firm of plate workers publish the following hints, which apply with equal force to all makes of dry plates: Open only in a ruby light. Keep cool and dry. Do not wet the plate before development. Do not drop plate into developer. Do not use Pyro developer for a second plate. Lay the dry plate in dry dish and pour developer over it in one sweep taking care plate is well covered. Rock dish occasionally during development. Test your developing light, your camera, your dark slides, your shutter, however "safe" you may consider your light. Do not expose plates to it more than is absolutely necessary. Have a cover for dish during development. Do not fix plate directly you see enough detail, but give enough time to acquire density also. Fix thoroughly, and always use alum bath after fixing. Do not expose plate to white light until this has been done. In warm weather use alum bath before fixing. Have all your solutions and washing water as nearly same temperature as possible, and under 60 degrees if you can; differences of temperature tend to produce frilling; warm developer induces fog and flatness, very cold developer takes a long time to act, and may be used stronger.

Society Notes.

Photographers' Association.—Pursuant to a circular sent to every photographer in the State, calling for a meeting of the fraternity, quite a number of photographers from various portions of Virginia met in Richmond March 4th, and a meeting was held at Murphy's Hotel. All the city galleries were represented, and Mr. Lineback, of Roanoke, acted as temporary chairman. A constitution and by-laws were adopted, with the purpose of bettering the trade and improving photography in Virginia. The election of officers resulted as follows: A. H. Plecker, Lynchburg, President; W. E. Eutsler, Danville, First Vice-President; A. Homeier, Richmond, Second Vice-President; A. S. Bradley, Richmond, Third Vice-President; H. V. Lineback, Roanoke, Secretary; B. T. Archer, Richmond, Treasurer. These, with J. T. Wampler, Charlottesville, and Charles L. Maury, Roanoke, constitute the board of trustees. The association starts out with more than seventy members.

California Camera Club.—The California Camera Club at its annual meeting elected the following officers: E. G. Zeile, President; I. E. Thayer, Vice-President; W. B. Webster, Second Vice-President; H. B. Hosmer, Secretary; E. G. Eisen, Treasurer; A. G. McFarland, Corresponding Secretary; W. C. Mackintosh, Librarian; W. E. Goodrum, E. W. Jensen, J. J. B. Argenti and B. C. Cantwell, directors. The reports show the association to be the largest and best equipped of its kind in the world. The roll contains the names of 162 active, 190 contributing and 18 associate members. The Treasurer's report tells of financial success, and there is a balance of $517.19 to the club's credit. A. G. McFarland, the retiring President, who has served in that capacity for years and refused re-election, gives in his annual report the highest praise to the committee who have worked so faithfully with him to make his administration a success. In referring to the general work of the club he said: "Each year shows a very marked improvement over the preceding, in slide work and in prints, in gallery and in outdoor work, showing that the time given to our outings and demonstrations makes us the more perfect in the fascinating art. This continued improvement will keep us in the position we now hold." He makes special mention of the members outside of the committees, who have all worked with a zeal to bring the club to its prosperous condition. Special mention was made of the Librarian, H.

C. Owens, and the Assistant Secretary, Miss Voy; Dr. S. C. Passavant and W. C. Mackintosh, in the lantern and slide work; Captain W. G. Leale, who has given the club marine outings; W. J. Street, of the outing and print exhibition committees, and H. B. Hosmer, of the demonstration work.

Photographic Literature.

Encyklopedie der Photographie.—Number 20 Die Behandlung der für den "Aus copier Process" bestummten Emulsions papiere· By Edward Valenta; 187 pp., 21 illustrations in text. Number 21, Die "Photographicsche Retouche." By G. Mercaton; 80 pp., 5 illustrations in text. Wilhelm Knapp, Halle a. S., 1896.

These two latest contributions to photographic literature emanating from the great printing house of Wilhelm Knapp, at Halle, on the Saale, are fully equal the preceding numbers which have been reviewed at length in our columns. This encyclopedic series of practical value, when completed will form a photographic library of reference superior to anything thus far published in connection with heliography. The typographical features of this work are second to none, while the names alone of the various contributors are a guarantee for the thoroughness with which each and every subject is treated. In the near future we expect to publish a few translations from both of the above named works.

Die Lichtempfindlichen Papiere der Photographie.—By Dr. H. C. Stiefel; published by A. Hartleben, Vienna, Pesth, and Leipzig.

This work, number 218 of Hartleben's chemi-technical series is o special interest to the professional photographer, and similar to most of its predecessors of the Hartleben press in the present series is practical and exhaustive. The book consists of 178 pages of text with 21 illustrations.

Dr. Stiefel, who for years past has been engaged in the manufacture of photographic chemicals and sensitive papers, is especially fitted to write upon the subject of the chemical manipulation of both negative and positive processes. All the various chemical processes are treated, from the making of the emulsion to the refining of the residues of the various processes. The various formulæ are given in a concise and practical form.

In the Twilight Hour.

ODDITY is not originality.

GOSSIP is always partly slander.

HOPING for the best helps deserve it.

THE bachelor girl is the girl who failed to capture a bachelor.

HONESTY is the best policy, but not always the winning policy.

NECESSITY is the mother of invention, and poverty is its stepmother.

FEW men care to tell the exact truth concerning their success.

WHEN a woman is tempted to tell the truth she always stops to think what people will say.

A DOLLAR saved is a dollar somebody else will probably spend.

THE eleventh commandment should read about as follows: "Mind your own business."

EVERY unmarried woman is more or less of an optimist. While there's life there's hope.

THE advanced women are known by the silly conventions they are so fond of holding.

TOO many people make the mistake of regarding conscience as a matter of majority rule.

IF jealousy is foolish, so is love.

THE rod never does good unless the hand of love holds it.

A MAN of honor respects his word as his bond.

A GRAIN of truth will make itself known amid a bushel of falsehoods.

TO MY thinking charity is the New Testament told in a word.—*Edgar Saltus.*

THE world is full of beauty, as other worlds above; and if we did our duty it might be full of love.

THERE is always hope in a man who actually and earnestly works. In idleness alone is there perpetual despair.—*Carlyle.*

IT is easy to see that the number of "new" women is not regulated by the law of supply and demand. If it was there would be none.

SINCE I cannot govern my tongue, though within my own teeth, how can I hope to govern the tongues of others?—*Franklin.*

TRUE contentment depends not on what we have. A tub was large enough for Diogenes, but the world was too small for Alexander.

LET it make no difference to thee whether thou art cold or warm, whether thou art ill spoken of or praised, if thou art doing thy duty.—*Marcus Aurelius.*

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